

**PRINTING INDUSTRY AND
USE CLUSTER PROFILE**

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EXECUTIVE SUMMARY

USE CLUSTER PROFILE

This report presents a profile of the printing industry and defines a use cluster. Prepared as background for the U.S. Environmental Protection Agency (EPA), Office of Pollution Prevention and Toxics' analysis of printing use cluster chemicals, this report presents an overview of the chemicals, technologies, and processes used in the printing industry. Based on published information, this report's preparation involved neither original research nor an industry survey.

A use cluster is defined as a set of competing chemicals, processes, or technologies. Traditionally, EPA assessed the potential hazards and exposure scenarios of specific chemicals, and, generally, left the evaluation of potential substitutes as a post-risk assessment consideration. The use cluster approach considers all substitutes within a given use, and leaves consideration of alternate uses as a potential follow up activity.

Extremely limited information was found on the volume of chemicals used in the printing industry; however, information was found on inks and ink raw materials. In 1991, the U.S. market for printing ink was 1.9 billion pounds. The printing ink market is expected to grow at an average annual rate of 2.2 percent through 1996 when the domestic market is expected to total almost 2.2 billion pounds. Of the raw materials consumed in U.S. ink manufacture in 1991, excluding water, hydrocarbon and oxygenated solvents accounted for 35 percent, resins for 26 percent, oils (minerals oils as well as natural and synthetic drying oils) for 19 percent, pigments for 17 percent, and a wide range of additives for the remaining three percent. Similar information was not available for cleaning solvents or other chemicals used in the industry.

PRINTING INDUSTRY

The printing industry is comprised of firms engaged in printing as well as firms which perform services for the printing trade, such as platemaking and bookbinding. The industry also includes firms engaged in publishing newspapers, books, and periodicals, regardless of whether or not they do their own printing. Firms functioning outside of what is traditionally defined as the printing and publishing industry also perform printing and related activities. For example, firms in many industries do printing in order to produce materials for internal use (i.e., in-plant printers). Other examples include: firms doing textile printing; manufacturers of products, especially packaging, that contain incidental printing; and manufacturers of printed circuit boards.

There are several estimates of the number of firms in the printing and publishing industry. Based on Census data, in 1987 there were about 58,000 firms operating a total of almost 62,000 establishments. The number of firms had increased to about 60,000 in 1993. However, the Census estimate does not include firms that do printing or related operations but whose primary activity is not printing or publishing. A.F. Lewis Co., Inc., a leading source of statistics for the industry, estimates that in the late 1980s there were almost 70,000 establishments in the U.S. performing some combination of prepress, press, or postpress operations. Almost 60,000 of these establishments were believed to have presses. It is believed, however, that these data excluded most of the screen printers. Their inclusion leads to an estimate of about 100,000 printing establishments in the U.S.

While the industry accounts for a significant portion of the Nation's total volume of goods and services, it also represents the largest conglomeration of small businesses in the domestic manufacturing sector. Nearly 80 percent of the plants in the industry employ less than 20 people. Most firms in the industry serve local or regional markets, though some printers and many publishers reach national and international markets.

In 1987, the industry employed approximately 1.5 million people with an annual payroll exceeding \$33 billion. While employment remained steady, payroll increased to \$39 billion in 1993. The Bureau of the Census estimates that in 1987, the total value of shipments for the printing and publishing industry was over \$136 billion and by 1991 was almost \$157 billion. When taking inflation into consideration, however, the industry experienced a decline in value of shipments of more than 2.0 percent over that period. The total value of shipments for 1993 was expected to be over \$176 billion, which in constant dollars represents a return to 1987 levels. These estimates, however, exclude perhaps \$90 to \$100 billion worth of printed goods produced by in-plant printers and quick printers and by packaging manufacturers. The industry's poor performance during 1987 through 1991 was due primarily to overall sluggish economic growth during the period, particularly the recession of 1990 to 1991. Based on constant dollar sales, the printing industry is expected to grow by 3.8 to 5.3 percent annually between 1990 and 2000. Strong growth in the industry will result from a recovering U.S. economy as well as demographic trends favorable to the industry such as a substantial growth in the number of households and school-age children.

The printing industry is a very diversified and sophisticated industry owing to the multiplicity of printing processes utilized. The five most common printing processes, lithography, letterpress, flexography, gravure, and screen printing, currently account for about 97 percent of the value of the output of the U.S. printing industry. Based on the estimated value of 1990 shipments by the U.S. commercial printing industry, lithography accounted for 47 percent of the market; gravure, 19

percent; flexography, 17 percent; letterpress, 11 percent; and screen printing, 3 percent. The importance of letterpress, until the 1940s the dominant printing process, is declining very rapidly and is being replaced by lithography and flexography.

PRINTING PROCESS BACKGROUND

Some of the printing processes have several major subprocesses based primarily on the types of substrate or products printed. Lithography is divided into three subprocesses: sheetfed offset, heatset web offset, and non-heatset web offset. Gravure includes publication gravure, packaging gravure, and product gravure. Flexography consists of publication flexography and packaging flexography.

In addition to the five major printing processes already mentioned, there are various plateless printing processes. All comparatively new technologies, these include: electronic printing processes such as xerography and laser printing; ink jet printing; magnetography; thermal printing; ion deposition printing; direct charge deposition printing; and the Mead Cycolor Photocapsule process. Plateless printing processes are gradually becoming an important force in the industry because of their relative ease of use and the growing application of computer controlled printing operations. Although plateless processes accounted for only about three percent of total U.S. printing industry output in 1991, they are forecast to have a 21 percent market share by 2025.

The five major printing processes are distinguished by the method of image transfer and by the general type of image carrier employed. Depending upon the process, the printed image is transferred to the substrate either directly or indirectly. In direct printing the image is transferred directly from the image carrier to the substrate. The direct printing processes are gravure, flexography, letterpress, and screen printing. In indirect, or offset, printing, the image is first transferred from the image carrier to the blanket cylinder and then to the substrate. Lithography, currently the dominant printing technology, is an offset process.

Image carriers can generally be classified as one of four types: relief, planographic, intaglio, or screen. In *relief printing*, the image or printing area is raised above the nonimage areas. Of the five major printing processes, those relying on relief printing are letterpress and flexography. In *planographic printing*, the image and nonimage areas are on the same plane. The image and nonimage areas are defined by differing physicochemical properties. Lithography is a planographic process. In the *intaglio process*, the nonprinting area is at a common surface level with the substrate while the printing area, consisting of minute etched or engraved wells of differing depth and/or size, is recessed. Gravure

is an intaglio process. In the *screen process* (also known as porous printing), the image is transferred to the substrate by brushing ink through a porous mesh which carries the pictorial or typographic image.

PRINTING PROCESS DESCRIPTION

Each printing process can be divided into three major steps: prepress, press, and postpress. Prepress operations encompass that series of steps during which the idea for a printed image is converted into an image carrier such as a plate, cylinder, or screen. Prepress operations include composition and typesetting, graphic arts photography, image assembly, and image carrier preparation. Press refers to actual printing operations. Postpress primarily involves the assembly of printed materials and consists of binding and finishing operations.

Within each process, a variety of chemicals are used, depending on the types of operation involved. Prepress operations typically involve photoprocessing chemicals and solutions. Inks and cleaning solvents are the major types of chemicals used during press operations. Depending on the finishing work required, postpress operations can use large amounts of adhesives. This is especially true where the production of books and directories is involved. Of all the chemicals used in a typical printing plant, inks and organic cleaning solvents are the categories used in the largest quantities. Many of the chemicals used in the printing industry are potential hazards to human health and the environment.

The printing industry has been experiencing a period of great change, much of it fueled by the already widespread and still rapidly growing application of computers to the printing industry. In addition to the rapid growth of plateless technologies discussed above, major industry trends include:

- o Increased automation;
- o Continued rapid development in computer-based front-end platforms (e.g., desktop publishing);
- o Advances in telecommunications and the introduction of digital data exchange standards;
- o Development of new image carrier and image carrier preparation technologies including direct-to-plate and direct-to-press processes and waterless lithographic plates that do not require a dampening system;

- o Increasing use of no- and low-VOC (volatile organic compound) fountain solutions, press cleaners, inks, and adhesives; and,
- o Increased recycling of ink.

PART ONE:

PRINTING INDUSTRY PROFILE

I. OVERVIEW

The definition of the printing industry used in this study is based primarily on the Bureau of the Census' definition as set forth under Standard Industrial Classification (SIC) Code Major Group 27 -- Printing, Publishing, and Allied Industry. A complete outline of Major Group 27 is presented in Appendix A. It should be noted, however, that various industries outside Major Group 27 are also engaged in printing and related activities and that, when possible, these industries have been addressed in the study. These include firms doing textile printing, manufacturers of products that contain incidental printing, and manufacturers of printed circuit boards.

Major Group 27 is comprised of firms engaged in printing by one or more common processes, such as lithography, letterpress, flexography, gravure, and screen printing, as well as firms which perform services for the printing trade, such as platemaking and bookbinding. The industry also includes firms engaged in publishing newspapers, books, and periodicals, regardless of whether or not they do their own printing (SIC 1987).

Tables 1 and 2 summarize some of the important statistics for Major Group 27 available from the Bureau of the Census. Table 1 presents the data available from the 1991 Annual Survey of Manufactures, the latest year available. Table 2 presents more detailed data from the 1987 Census of Manufactures. (The Census is conducted every five years but as of May 1994, the results of the 1992 Census were not yet available.) Finally, 1993 printing industry statistics available from the 1993 U.S. Industrial Outlook are presented in the text.

In 1987, there were by conservative estimate about 58,000 firms in the industry operating a total of almost 62,000 establishments. By 1993 the number of firms had increased to about 60,000, though an estimate of the total number of establishments operated by these firm was not available. Industry employment in 1987 was approximately 1.5 million people with an annual payroll exceeding \$33 billion. Employment remained constant at around 1.5 million people through 1993 but annual payroll grew to almost \$39 billion (BOC 1990a; BOC 1990b; BOC 1990c; USIO 1993).

The economic performance of the printing and publishing industries is affected by a number of factors, including rate of population increase, level of educational attainment, personal consumption expenditures, availability of leisure time, level of U.S. business activity (e.g., business formations, advertising, and financial market activity), and competition from the electronic media (USIO 1992). In 1987, the total value of shipments for the industry was over \$136 billion and by 1991 was almost \$157 billion. However, in constant dollars, the value of shipments in 1991 was more than 2.0 lower than in 1987. The

PRINTING INDUSTRY OVERVIEW

- In 1987, the Printing and Publishing Industry:
 - Consisted of at least 58,000 firms operating 62,000 establishments
 - Employed 1.5 million people
 - Had an annual payroll in excess of \$33 billion
 - Accounted for shipments valued at over \$136 billion
 - Represented the largest conglomeration of small businesses in the manufacturing sector
 - 80 to 85 percent of the plants in the industry employed fewer than 20 people.
- The industry is expected to grow by 3.8 to 5.3 percent annually between 1990 and 2000.
- The five most common printing processes currently account for 97 percent of the value of the output of the U.S. printing industry.
- The five processes and their 1991 market shares are:
 - Lithography - 47%
 - Gravure - 19%
 - Flexography - 17%
 - Letterpress - 11%
 - Screen Printing -3%

Figure 1. Printing Industry Overview

Table 1. Selected Statistics for SIC Major Group 27 --
Printing, Publishing, and Allied Industries, 1991

All Employees				

Industry Category	Total employees (000)	Production Workers (000)	Payroll (Mil \$)	Value of Shipments (Mil \$)

271 Newspapers	428.4	145.1	10308.7	33702.1
272 Periodicals	110.6	20.7	3661.0	20345.1
273 Book Publishing	125.8	55.0	3699.9	20736.1
274 Miscellaneous Publishing	65.0	22.6	1779.7	9762.0
275 Commercial Printing, Total	556.0	400.7	14135.4	51948.1
2752 Lithographic	N.A.	N.A.	N.A.	37762.0
2754 Gravure	N.A.	N.A.	N.A.	3239.0
2759 NEC	N.A.	N.A.	N.A.	10760.4
276 Manifold Business Forms	46.3	32.2	1269.2	7233.5
277 Greeting Cards	23.9	12.5	609.1	3809.9
278 Blankbooks & Bookbinding	70.4	53.9	1394.6	4571.4
279 Printing Trade Services	61.6	44.5	1884.3	4576.5
=====				
GRAND TOTALS	1488.0	787.2	38741.7	156,684.6

N.A. - Not available.

NOTE: An establishment's shipments include those products assigned to an industry (primary products), those considered primary to other industries (secondary products), and receipts for miscellaneous activities (merchandising, contract work, resales, etc.).

Source: BOC 1993.

Table 2. Selected Statistics for Major Group 27 -- Printing,
Publishing, and Allied Industries, 1987

Industry Category	Companies	All Establishments		All Employees			Value of Shipments (Mil \$)	Ratios	
		Number of Establ.	With 20 or more employees	Total employees (000)	Total Production Workers (000)	Payroll (Mil \$)		Speciali- zation (%)	Coverage (%)
2711 Newspapers	7465	9091	2617	434.6	148.5	9025.0	31849.2	97	100
2721 Periodicals	3757	4020	876	110.0	18.3	2982.7	17329.2	95	96
2731 Book Publishing	2180	2298	424	70.1	15.9	1859.8	12619.5	92	95
2732 Book Printing	520	561	269	43.5	34.4	961.4	3256.3	89	88
2741 Miscellaneous Publishing	2136	2369	597	69.4	24.1	1513.2	7809.5	98	91
2752 Commercial Printing, Lithographic	24328	24980	4099	403.0	292.9	9132.1	32698.2	94	94
2754 Commercial Printing, Gravure	353	397	113	25.5	20.5	723.8	3187.7	85	94
2759 Commercial Printing, NEC Letterpress	10607	10421	1388	120.3	84.4	2365.4	8628.3	93	97
Engraving & Plate		375		5.9	4.4	124.5	344.9		
2761 Manifold Business Forms	601	853	586	53.2	37.2	1276.4	7358.9	94	97
2771 Greeting Cards	147	162	64	21.5	11.9	471.1	2911.1	82	96
2782 Blankbooks & Looseleaf Binders	349	511	326	39.1	29.5	767.9	2904.7	89	93
2789 Bookbinding & Related Work	1009	1035	368	29.6	24.6	496.5	1174.7	95	94
2791 Typesetting	3317	3364	437	37.6	29.5	809.2	1783.7	96	83
2796 Platemaking Services	1328		463					96	90
Engraving & Plate		226		4.5	3.0	103.8	294.0		
Gravure		65		1.7	1.4	55.3	127.9		
Lithographic		909		23.4	16.2	760.7	1824.3		
Photoengraving, Electro- typing, & Stereotyping		214		2.2	1.6	55.1	129.2		
GRAND TOTALS	58097	61851	12627	1495.1	798.3	33483.9	136231.3		

NOTE: An establishment's shipments include those products assigned to an industry (primary products), those considered primary to other industries (secondary products), and receipts for miscellaneous activities (merchandising, contract work, resales, etc.). Specialization and coverage ratios measure the relationship of primary product shipments to industry shipments.

Specialization ratio represents the ratio of primary product shipments to total product shipments (i.e., primary plus secondary product shipments) for the establishments classified in the industry.

Coverage ratio represents the ratio of primary products shipped by the establishments classified in the industry to the total shipments of such products that are shipped by all manufacturing establishments wherever classified.

Source: BOC 1990a,b,c.

total value of shipments for 1993 was expected to be over \$176 billion which in constant dollars represents a return to 1987 levels (BOC 1990a; BOC 1990b; BOC 1990c; BOC 1993; USIO 1993). These estimates, however, exclude perhaps \$90 to \$100 billion worth of printed goods produced by in-plant printers and quick printers and by packaging manufacturers. The industry's poor performance from 1987 through 1991 was due primarily to overall sluggish economic growth during the period, particularly the recession of 1990 to 1991 (USIO 1993). However, based on constant dollar sales, the industry is expected to grow by 3.8 to 5.3 percent annually through 2000 (SRI 1990). Strong growth in the industry will result from a recovering U.S. economy as well as demographic trends favorable to the industry such as a substantial growth in the number of households and school children (USIO 1993).

While the industry accounts for a significant portion of the Nations' total volume of goods and services, it also represents the largest conglomeration of small businesses in the domestic manufacturing sector. Nearly 80 percent of the plants in the industry employ less than 20 people (BOC 1990a; BOC 1990b; BOC 1990c). Most firms in the industry serve local or regional markets, though some printers and many publishers reach national and international markets (USIO 1992).

The five most common printing processes, lithography, letterpress, flexography, gravure, and screen printing, currently account for about 97 percent of the value of the output of the U.S. printing industry (Bruno 1990; Bruno 1991). Based on the estimated value of 1990 shipments by the U.S. commercial printing industry, lithography accounted for 47 percent of the market; gravure, 19 percent; flexography, 17 percent; letterpress, 11 percent; and screen printing, 3 percent (Bruno 1991).

The five major printing processes are distinguished by the method of image transfer and by the general type of image carrier (or plate) employed. Depending upon the process, the printed image is transferred to the substrate either directly or indirectly. In direct printing, the image is transferred directly from the image carrier to the substrate. The direct printing processes are gravure, flexography, letterpress, and screen printing. In indirect, or offset, printing, the image is first transferred from the image carrier to an intermediate cylinder called the blanket cylinder and then to the substrate. Lithography, currently the dominant printing technology, is an offset process (Kirk-Othmer 1982).

Image carriers can generally be classified as one of four types: relief, planographic, intaglio, or screen. In *relief printing*, the image or printing area is raised above the nonimage areas. Everyday office equipment such as rubber stamps and typewriters offer simple illustrations of relief printing. Of the

five major printing processes, those relying on relief printing are letterpress, which typically uses cast metal plates, and flexography, which employs elastomeric plates.

In *planographic printing*, the image and nonimage areas are on the same plane. The image and nonimage areas are defined by differing physicochemical properties. The non-image areas are treated to be hydrophilic, or water loving, and will not accept ink. The image areas, on the other hand, are treated to be hydrophobic and oleophilic or water repellant and oil receptive, and ink will adhere to these areas. Lithography is a planographic process (Adams 1988).

In the *intaglio process*, the nonprinting area is at a common surface level with the substrate and the printing area, consisting of minute etched or engraved cells of differing depth and/or size, is recessed. Gravure is an intaglio process (Adams 1988).

In the *screen process* (also known as porous printing), the image is transferred to the substrate by brushing ink through a porous mesh which carries the pictorial or typographic image (Kirk-Othmer 1982; McGraw-Hill 1987).

In addition to the five major printing processes already discussed, there are a number of other printing technologies in use. These include various electronic, electrostatic, magnetographic, thermographic ion-deposition, ink-jet, and Mead Cycholor printing processes. Currently, these processes account for only about three percent of the market. However, their market share is expected to increase to over 20 percent by 2025 (Bruno 1990; Bruno 1991).

Further description of the five major printing processes, their applications, and their current and projected market shares are presented in Figure 2 and Table 3.

APPLICATIONS OF THE MAJOR PRINTING PROCESSES

- | | |
|--|---|
| <ul style="list-style-type: none"> ● LITHOGRAPHY <ul style="list-style-type: none"> - Magazines - Newspapers - Books - Envelops - Labels and tags | <ul style="list-style-type: none"> - Stationery - Greeting Cards - Advertising - Packaging (Folding Paper Boxes) |
| <ul style="list-style-type: none"> ● FLEXOGRAPHY <ul style="list-style-type: none"> - Packaging - Newspapers | <ul style="list-style-type: none"> - Magazines - Directories |
| <ul style="list-style-type: none"> ● GRAVURE <ul style="list-style-type: none"> - Packaging - Advertising - Magazines - Bank Notes - Stamps | <ul style="list-style-type: none"> - Art Books - Annual Reports - Tissue Products - Wall Coverings - Films and Laminates |
| <ul style="list-style-type: none"> ● LETTERPRESS <ul style="list-style-type: none"> - Magazines - Newspapers - Books | <ul style="list-style-type: none"> - Stationery - Advertising |
| <ul style="list-style-type: none"> ● SCREEN <ul style="list-style-type: none"> - Signs - Electronics - Fine Arts - Ceramics and Glass - Textiles | <ul style="list-style-type: none"> - Decals - Nameplates and Panels - Containers and Other 3-Dimensional Items |
| <ul style="list-style-type: none"> ● PLATELESS <ul style="list-style-type: none"> - Short-Run Business Forms - Manuals - Bar and Batch Codes - Tickets | <ul style="list-style-type: none"> - Personalized Computer Letters - Sweepstakes Mailers - Tags - Checks |

Figure 2. Applications of the Major Printing Processes

Table 3. Description, Applications, and Percent Distribution of Major Printing Processes

Process	Description	Major Applications	Projected Percent Distribution			
			1991	1995	2000	2025
Lithographic	Indirect (or offset) printing using and intermediate element (blanket) between image carrier and substrate	Magazines, newspapers, books, stationery, envelops, labels, tags, greeting cards, advertising, packaging	47	47	45	35
Gravure	Printing method based on photography and photomechanics capable of reproducing continuous tone pictures	Packaging, advertising, magazines, art books, bank notes, stamps, annual reports, tissue products, wall coverings, films and laminates	19	18	17	16
Flexography	Direct transfer of an image from an inked flexible plate, frequently used on a rotary press	Packaging, newspapers, magazines, directories	17	18	19	21
Letterpress	Image transferred under pressure directly to paper from inked plate	Magazines, newspapers, books, stationery, advertising	11	8	5	4
Screenprint	Ink is passed through unblocked part of porous mesh to form printed image	Signs, electronics, ceramics and glass, decals nameplates, panels, advertising specialties, fine arts, textiles, containers and other 3-dimensional objects	3	3	3	3
Other	Electronic, ink jet, and other plateless processes	Short-run forms, manuals, computer letters, sweepstake mailers, bar and batch codes, tickets, tags, checks	3	6	11	21

Source: Bruno 1990; Bruno 1991; Kirk-Othmer 1982; McGraw-Hill 1987.

II. COMPANIES AND PLANTS

Various sources estimate that there are between 62,000 and 70,000 establishments in the U.S. printing and publishing industry. (These estimates, however, are believed to exclude many if not most of the 40,000-plus plants with screen presses, so the actual number of establishments may be closer to 100,000.) Nearly 60 percent of these establishments are found in only ten states: California, New York, Illinois, Texas, Florida, Pennsylvania, Ohio, New Jersey, Michigan, and Massachusetts. Almost 60,000 of the 70,000 industry establishments are believed to have presses of which about 54,000 have lithographic presses. Gravure presses are found at the fewest number of plants; only about 1,100 plants have these types of presses. Establishments without presses are trade services supporting the industry such as platemakers and binders. From 80 to 85 percent of all establishments in the industry have fewer than 20 employees. However, plants with flexographic or gravure presses tend to have a larger number of employees than plants with letterpress, lithographic, or screen presses.

A. Number of Companies and Plants

Based on 1987 Bureau of the Census data¹, the printing, publishing, and allied industries were comprised of 61,851 plants operated by 58,097 companies, a ratio of about 1.1 plants per firm. By 1993 the number of firms had increased to about 60,000, however, information on the number of plants these companies operated was not available (BOC 1990a; BOC 1990b; BOC 1990c; USIO 1993).

The number of firms and plants in the printing, publishing, and allied industries reported by the Bureau of the Census does not, however, capture all plants that have presses. For example, the Census data do not include many companies such as packaging, textile, and electronic manufacturers which do printing that is incidental to their primary business.

¹ The Bureau of the Census prepares the Census of Manufactures every five years. (At the time this report was prepared, the results of the 1992 census were not available, so the 1987 data were used.) For the purpose of the Census of Manufactures, the Bureau of the Census defines a company as a business organization consisting of one or more establishments under common ownership or control. For the census, each individual manufacturing establishment (or plant) in operation at any time during the census year is required to submit a separate reporting form describing its activities to the Bureau of the Census (BOC 1990a). The Census of Manufactures report for the printing, publishing and allied industries (SIC Code Major Group 27) compiles company, establishment, and employee statistics for all of the sub-industry categories (outlined in Table 1) based on the data contained in the establishment reports submitted to the Bureau of the Census.

More comprehensive data on the printing and publishing industry is available from A.F. Lewis & Company, Inc., a market research company specializing in the graphics arts industry. Table 4 presents the A.F. Lewis estimate of the total number of operating plants in the industry in 1990. The table is grouped by employee size, EPA region, and state (see Figure 3 for states by EPA region). Operating plants include those establishments which perform any combination of prepress, press, or postpress services. Of the 69,714 plants, an estimated 59,636 have presses. The remainder represent trade services supporting the graphics arts industry (A.F. Lewis).

B. Geographic Distribution

Table 4 and Figure 4 present information on the geographic distribution of operating plants in the printing industry. As can be seen in the Table, EPA regions 2, 4, 5, and 9 each account for more than ten percent of total operating plants, and combined account for over 62 percent of all plants. Ten states account for nearly 60 percent of all operating plants; the top four account for one-third of the total. The 10 states and their share of total operating plants are as follows (A.F. Lewis):

California (Region 9)	12.4%
New York (Region 2)	8.1%
Illinois (Region 5)	7.1%
Texas (Region 6)	6.1%
Florida (Region 4)	4.4%
Pennsylvania (Region 3)	4.4%
Ohio (Region 5)	4.3%
New Jersey (Region 2)	3.9%
Michigan (Region 5)	3.7%
Massachusetts (Region 1)	3.0%

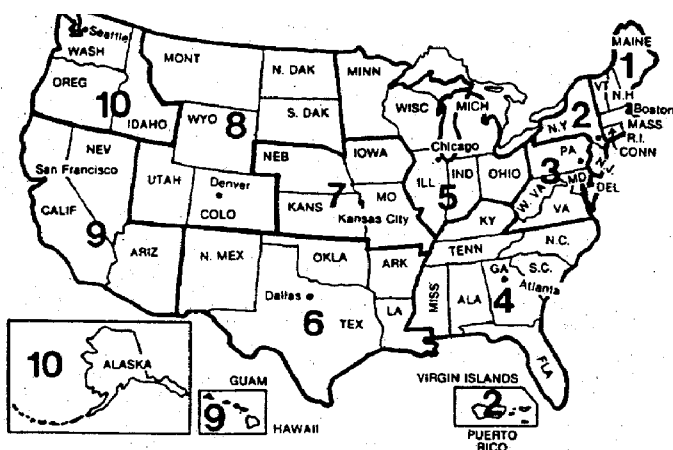


Figure 3. USEPA Regions

Table 4. Total Number of Operating Plants by Employee Size,
EPA Region, and State, 1990

		Number of Employees						% of Each Region	% of Total Plants	
EPA REGION/STATE		1-4	5-9	10-19	20-49	50-99	100+			Total Plants
REGION 1										
CONNECTICUT		456	284	182	126	65	54	1167	26.0	1.7
MAINE		187	67	31	24	11	10	330	7.4	0.5
MASSACHUSETTS		888	483	293	228	99	87	2078	46.3	3.0
NEW HAMPSHIRE		178	90	61	37	10	13	389	8.7	0.6
RHODE ISLAND		143	75	54	43	17	11	343	7.6	0.5
VERMONT		71	34	38	17	9	12	181	4.0	0.3
Total Region	1	1923	1033	659	475	211	187	4488	100.0	6.4
REGION 2										
NEW JERSEY		1036	749	457	247	124	99	2712	32.5	3.9
NEW YORK		2223	1398	956	649	231	183	5640	67.5	8.1
Total Region	2	3259	2147	1413	896	355	282	8352	100.0	12.0
REGION 3										
DELAWARE		39	37	19	24	4	3	126	2.0	0.2
MARYLAND		382	272	217	130	45	49	1095	17.7	1.6
PENNSYLVANIA		1332	705	459	309	139	131	3075	49.7	4.4
VIRGINIA		492	294	179	127	46	50	1188	19.2	1.7
WASHINGTON, DC		139	107	92	45	15	10	408	6.6	0.6
WEST VIRGINIA		128	75	35	25	9	9	281	4.6	0.4
Total Region	3	2512	1490	1001	660	258	252	6173	100.0	8.9
REGION 4										
ALABAMA		333	170	95	68	14	14	694	7.3	1.0
FLORIDA		1487	806	418	220	76	50	3057	32.2	4.4
GEORGIA		614	351	221	118	57	46	1407	14.8	2.0
KENTUCKY		353	183	101	65	30	19	751	7.9	1.1
MISSISSIPPI		150	83	56	25	12	7	333	3.5	0.5
NORTH CAROLINA		676	359	231	131	61	48	1506	15.9	2.2
SOUTH CAROLINA		277	134	76	50	18	15	570	6.0	0.8
TENNESSEE		491	297	166	112	51	56	1173	12.4	1.7
Total Region	4	4381	2383	1364	789	319	255	9491	100.0	13.6
REGION 5										
ILLINOIS		2229	1137	694	497	208	198	4963	31.5	7.1
INDIANA		836	403	218	156	51	49	1713	10.9	2.5
MICHIGAN		1214	629	372	199	92	56	2562	16.3	3.7
MINNESOTA		715	366	228	152	60	72	1593	10.1	2.3
OHIO		1383	662	469	277	134	100	3025	19.2	4.3
WISCONSIN		839	452	267	172	86	81	1897	12.0	2.7
Total Region	5	7216	3649	2248	1453	631	556	15753	100.0	22.6
REGION 6										
ARKANSAS		511	195	118	56	16	11	907	13.6	1.3
LOUISIANA		409	178	90	46	20	13	756	11.3	1.1
NEW MEXICO		147	74	40	16	8	2	287	4.3	0.4
OKLAHOMA		214	113	71	48	10	11	467	7.0	0.7
TEXAS		2163	1095	486	322	118	91	4275	63.9	6.1
Total Region	6	3444	1655	805	488	172	128	6692	100.0	9.6

Table 4. Total Number of Operating Plants by Employee Size,
EPA Region, and State, 1990 (continued)

	Number of Employees							% of	% of
EPA REGION	1-4	5-9	10-19	20-49	50-99	100+	Total Plants	Each Region	Total Plants
REGION 7									
IOWA	453	273	131	86	50	18	1011	24.5	1.5
KANSAS	405	182	104	82	36	29	838	20.3	1.2
MISSOURI	763	419	229	158	51	59	1679	40.7	2.4
NEBRASKA	298	147	72	51	17	12	597	14.5	0.9
Total Region 7	1919	1021	536	377	154	118	4125	100.0	5.9
REGION 8									
COLORADO	635	290	145	68	28	23	1189	49.9	1.7
MONTANA	143	48	24	16	3	3	237	9.9	0.3
NORTH DAKOTA	102	46	25	14	3	3	193	8.1	0.3
SOUTH DAKOTA	138	47	32	15	6	1	239	10.0	0.3
UTAH	203	105	50	36	13	9	416	17.4	0.6
WYOMING	57	30	9	11	3	1	111	4.7	0.2
Total Region 8	1278	566	285	160	56	40	2385	100.0	3.4
REGION 9									
ARIZONA	396	211	105	73	16	13	814	8.3	1.2
CALIFORNIA	4421	2203	1029	604	208	155	8620	87.4	12.4
HAWAII	113	54	30	15	7	3	222	2.3	0.3
NEVADA	84	57	33	27	5	3	209	2.1	0.3
Total Region 9	5014	2525	1197	719	236	174	9865	100.0	14.1
REGION 10									
ALASKA	60	39	13	7	0	1	120	5.0	0.2
IDAHO	124	59	34	23	4	3	247	10.3	0.4
OREGON	472	238	91	63	20	15	899	37.6	1.3
WASHINGTON	556	263	154	94	32	25	1124	47.0	1.6
Total Region 10	1212	599	292	187	56	44	2390	100.0	3.4
U.S. TOTAL	32158	17068	9800	6204	2448	2036	69714		
Percent Of Total	46.1	24.5	14.1	8.9	3.5	2.9			

Note: Operating plants include: commercial printing; business forms printing; converters; newspaper printing and publishing; in-plant reproduction and prepress; and, trade services.

Source: A.F. Lewis 1991 (Table I-200, September 1990).

Ten Leading States and Their Percentage of Total Operating Plants

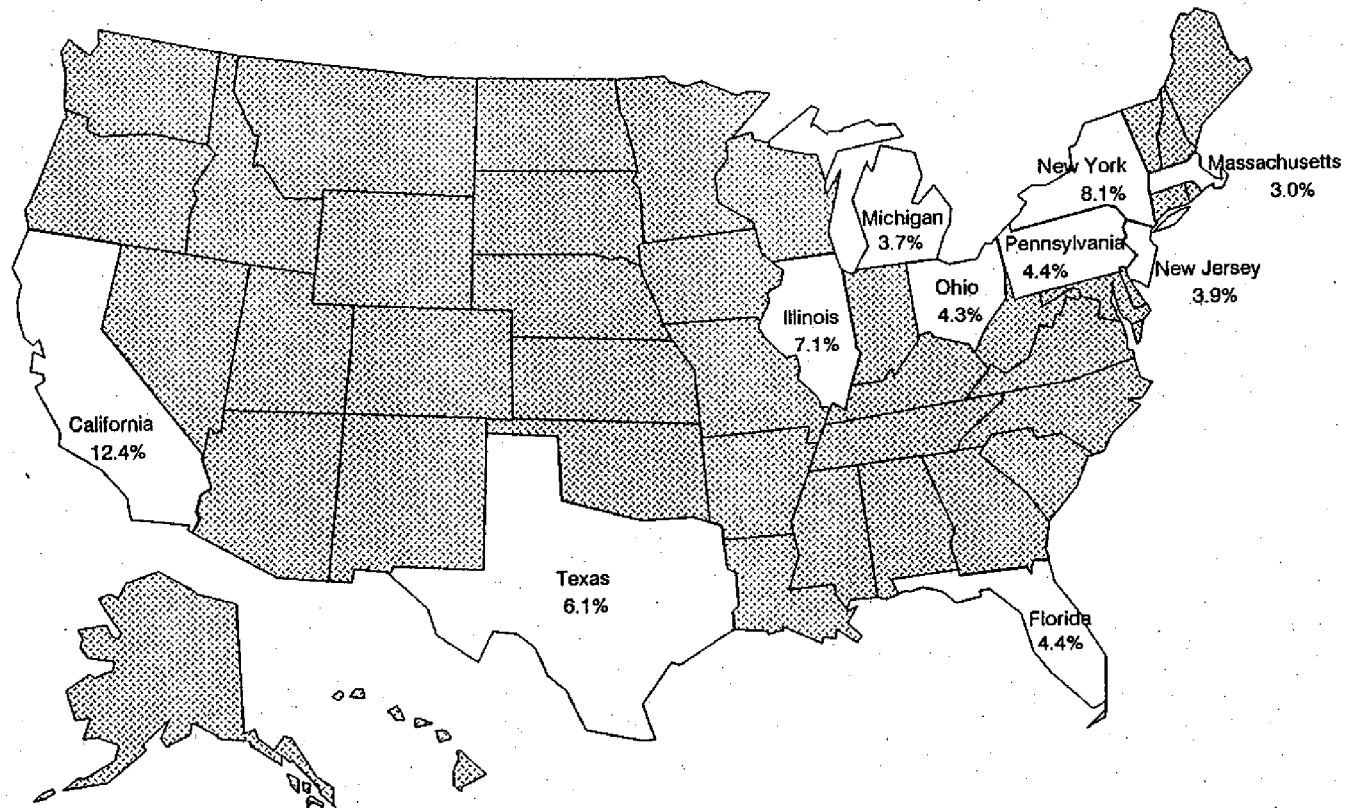


Figure 4. Geographic Distribution of Printing Plants (Source: A.F. Lewis)

C. Companies and Plants by Printing Process

The number of plants by press type is summarized in Figure 5. Detailed data on the number of plants by major printing process is presented in Table 5. It should be noted that data for the various processes and subprocesses presented in this table are from various years, primarily 1988 through 1991. The data on the total number of plants with letterpress presses, however, is from 1982. While recent data was available on the total number of plants with gravure and screen presses, no breakdown of plant size was available for these processes.

Table 5 shows that of a total of 59,636 plants with printing presses, 54,472, or 91.3 percent, have offset lithographic presses. Of the plants with lithographic presses, about 92 percent have sheetfed presses and 11 percent have webfed (adds to greater than 100 percent because some plants have both types of presses). Only 1,587 plants in the U.S. have flexographic presses (A.F. Lewis 1991). Based on a member survey, the Gravure Association of America reported that there were 1,090 plants with gravure presses in 1989 (GAA 1989). According to A.F. Lewis, 350 to 400 of these plants were printing publications while the remaining plants were performing printing incidental to the production of packaging or a wide range of products such as wall coverings (Lewis 1992). It should be noted that both flexographic and gravure presses tend to be found in medium to large size plants (A.F. Lewis 1991; GAA 1989).

In 1982, the latest year for which data are available, 20,786 plants had letterpress presses. More recent data was available on the number of plants with sheetfed letterpress presses; in 1988, such presses were in 18,961 plants. Data on the number of plants with rotary letterpress presses was not available. Industry sources believe that the number of plants with letterpress presses is declining (Purcell).

According to the Screen Printing International Association (SPAI) there are more than 40,000 plants in the U.S. with screen presses of which 19,000 are involved in textile printing (Kinter 1993). This estimate does not include an unknown but possibly substantial number of plants that use screen presses to print cans and containers as well as electronics plants that use screen printing in the production of electronic circuitry.

Additional information on the number of plants operated and types of presses used by the top 101 North American commercial and publication printers is provided in Appendix B. Appendix B shows that the total number of lithographic press units used by these companies far out number all other types of press units.

NUMBER OF PLANTS BY PRESS TYPE LATE 1980s

As many as 100,000 plants with presses

- Lithographic presses - over 54,000 plants
 - 92 percent with sheetfed presses
 - 11 percent with webfed presses
- Letterpresses - at least 19,000 plants
- Flexographic presses - 1,600 plants
- Gravure presses - 1,100 plants
- Screen presses - over 40,000 plants

Figure 5. Number of Plants by Press Type

Table 5. U.S. Total Number of Plants by Press Type and Employment Size

PRESS TYPE	Number of Employees per Plant												Total Plants	Date	Source
	1-4	% of Total	5-9	% of Total	10-19	% of Total	20-49	% of Total	50-99	% of Total	100+	% of Total			
All Operating Plants\1	32158	46.1%	17068	24.5%	9800	14.1%	6204	8.9%	2448	3.5%	2036	2.9%	69714	September 1990	AFL #I-200
All In-plant Printers\2	7080	53.9%	3297	25.1%	1824	13.9%	694	5.3%	155	1.2%	84	0.6%	13134	Summer 1990	AFL #I-500
All Trade Plants\3	3281	42.8%	1791	23.4%	1187	15.5%	884	11.5%	374	4.9%	143	1.9%	7660	November 1991	AFL #I-700
All plants with presses\4	27528	46.2%	14580	24.4%	8227	13.8%	5274	8.8%	2132	3.6%	1895	3.2%	59636	November 1991	AFL #I-800
All offset presses	25435	46.7%	13385	24.6%	7498	13.8%	4676	8.6%	1883	3.5%	1575	2.9%	54452	February 1991	AFL #IIIA-100
- sheetfed	24367	48.4%	12172	24.2%	7142	14.2%	4052	8.1%	1425	2.8%	1165	2.3%	50323	August 1988	AFL #IIIA-400
- single color															
14"x20" or smaller	24186	50.6%	11974	25.1%	6562	13.7%	3430	7.2%	987	2.1%	634	1.3%	47773	March 1989	AFL #IIIA-240
20½" to 33"	4285	27.8%	4195	27.3%	3600	23.4%	2174	14.1%	690	4.5%	444	2.9%	15388	July 1987	AFL #IIIA-480
34" or larger	559	14.6%	744	19.4%	897	23.4%	912	23.8%	422	11.0%	306	8.0%	3840	July 1987	AFL #IIIA-560
- multicolor															
14"x20" or smaller	na	na	na	na	na	na	na	na	na	na	na	na	na		
20½" to 33"	785	16.1%	984	20.2%	1265	26.0%	1105	22.7%	426	8.7%	304	6.2%	4869	July 1987	AFL #IIIA-500
34" or larger	272	5.7%	523	11.0%	1018	21.4%	1413	29.6%	830	17.4%	712	14.9%	4768	July 1987	AFL #IIIA-580
- webfed															
26½" or smaller	378	6.6%	707	12.3%	1248	21.6%	1510	26.2%	936	16.2%	987	17.1%	5766	February 1989	AFL #IIIA-800
27" or larger	223	8.4%	366	13.8%	617	23.2%	684	25.8%	409	15.4%	356	13.4%	2655	August 1989	AFL #IIIA-920
	213	5.9%	385	10.7%	707	19.7%	938	26.1%	594	16.5%	758	21.1%	3595	August 1989	AFL #IIIA-860
- heatset															
27" or larger	86	6.3%	111	8.1%	195	14.2%	261	19.0%	250	18.2%	473	34.4%	1376	February 1990	AFL #IIIA-820
	18	2.7%	25	3.8%	76	11.6%	100	15.2%	123	18.7%	316	48.0%	658	July 1987	AFL #IIIA-900
- non-heatset															
27" or larger	366	7.4%	662	13.4%	1140	23.0%	1376	27.8%	768	15.5%	638	12.9%	4950	February 1990	AFL #IIIA-880
	205	6.9%	335	11.3%	576	19.4%	814	27.4%	535	18.0%	503	16.9%	2968	July 1987	AFL #IIIA-840
All flexographic presses	193	12.2%	238	15.0%	289	18.2%	373	23.5%	198	12.5%	296	18.7%	1587	November 1989	AFL #IIIA-1500
All letterpresses	9487	45.6%	4515	21.7%	3335	16.0%	1835	8.8%	781	3.8%	833	4.0%	20786	Fall 1982	AFL #IIIA-1520
- sheetfed	8397	44.3%	4694	24.8%	2969	15.7%	1815	9.6%	623	3.3%	463	2.4%	18961	November 1988	AFL #IIIA-1540
- rotary	na	na	na	na	na	na	na	na	na	na	na	na	na		
All gravure presses	na	na	na	na	na	na	na	na	na	na	na	na	1090	1989	GAA 1989
All screen presses	na	na	na	na	na	na	na	na	na	na	na	na	> 40000	Fall 1993	Kinter 1993

1 - Operating plants include all firms primarily engaged in providing printing services including prepress, press, and postpress operations.

2 - In-plant printers are firms engaged in internal, non-commercial printing performing prepress, press, and postpress operations for businesses, government, schools, and institutions.

3 - Trade plants are firms which provide prepress or postpress services but do not engage in printing as their primary business.

4 - Plants with presses are firms which possess any printing press or duplicator/photocopier and engage in printing as their primary business.

Sources: GAA 1989; A.F. Lewis 1991; Kinter 1993

combined. Appendix C lists the top 100 U.S. screen printers and shows their major product lines. The majority of these companies specialize in printing garments and decals (Kinter 1992, 1993). It is unclear how many of the plants with screen printers are captured in A.F. Lewis' estimate of the total number of plants in the industry.

D. Size of Companies and Plants

Typically, a printing plant is small. Approximately 46 percent of the total operating plants shown in Tables 3 and 4 have less than five employees, 24.5 percent have between five and nine employees, and 14.1 percent have between 10 and nineteen employees. In total, nearly 85 percent of all plants in the printing, publishing and allied industries have fewer than 20 employees. Approximately 12 percent employ between 20 and 99 people. Less than three percent of all operating plants have 100 or more employees (A.F. Lewis). Information on printing industry plant size is summarized in Figure 6.

According to U.S. Bureau of the Census data, there is an average ratio of only 1.1 plants to every company in the industry. The low ratio of plants to companies means that the vast majority of companies in the printing, publishing and allied industries will also have fewer than twenty employees.

As noted above, the majority of plants and companies in the printing industry are small. This is especially true in lithographic printing where about 85 percent of plants with lithographic presses employ fewer than 20 people and roughly half employ less than five. Similarly, plants with letterpress tend to be small. In 1982, over 83 percent of plants with this type of press had fewer than 20 employees and almost 46 percent had fewer than five (A.F. Lewis 1991). The majority of plants with screen presses also have fewer than 20 employees (Kinter 1993).

Plants with flexographic and gravure presses tend, however, to be larger than plants using other types of presses. Almost 55 percent of plants with flexographic presses have 20 or more employees compared to less than 16 percent in the printing industry as a whole. No breakdown of the size of plants with gravure presses was available, but industry sources report that gravure presses are typically found at medium to large printers (GAA 1989). Information was available, however, for gravure commercial printing (SIC 2754), a major sector of the gravure industry. In 1987, 27 percent of the plants in this sector had 20 or more employees (BOC 1990b).

PLANT SIZE

- 80 to 85 percent of all operating plants have fewer than 20 Employees:

- Less than five employees	46%
- 5 to 9 employees	25%
- 10 to 19 employees	14%
- 20 to 99 employees	12%
- 100 or more employees	3%
- Typically, plants with lithographic, letter, and screen presses are small:
 - 85 percent of plants with lithographic presses employ fewer than 20 people
 - Over 83 percent of plants with letterpresses employ fewer than 20 people
 - A majority of plants with screen presses employ fewer than 20 people
- Generally, plants with flexographic and gravure presses are larger than plants with other types of presses:
 - Almost 55 percent of plants with flexographic presses have 20 or more employees
 - 27 percent of the plants in the commercial printing sector of the gravure industry have 20 or more employees

Figure 6. Printing Plant Size

III. VALUE OF SHIPMENTS, INTERNATIONAL TRADE, AND INDUSTRY OUTLOOK

The Bureau of the Census estimates that in 1987, the total value of shipments for the printing and publishing industry was over \$136 billion and by 1991 was almost \$157 billion. However, in constant dollars, 1991 sales were over 2.0 percent lower than in 1987. The total value of shipments for 1993 was expected to be over \$176 billion which in constant dollars represents a return to 1987 levels. These estimates exclude perhaps \$90 to \$100 billion worth of printed goods produced by in-plant and quick printers as well as by packaging manufacturers. In 1990, U.S. exports related to the printing and publishing industries outpaced imports by almost two to one. Canada was our largest trading partner in this area followed closely by the European Community. Based on sales, the printing industry is expected to grow by 3.8 to 5.3 percent annually between 1990 and 2000. Areas of particularly strong growth are expected to be: direct mail, inserts and coupons, other print advertising and free circulation newspapers, and quick printers.

A. Value of Shipments

Table 6 presents information on the value of shipments by industry category for the printing, publishing, and allied industries during the period 1987 through 1992. Unless otherwise noted, value of shipments for all years are given in constant 1987 dollars. In 1987, value of shipments for the industry totalled \$136.2 billion. By 1991, the total value of shipments of the printing and publishing industry was estimated to be almost \$157 billion in current dollars. However, in constant 1987 dollars the 1991 value of shipments totalled only about \$133 billion, a decline of over 2.0 percent from 1987. The estimates of the total value of shipments excludes, however, in-plant, quick, and packaging printing which, according to Bruno, produced roughly \$90 to \$100 billion worth of printed goods in 1989 (Bruno 1990). Printing is also an important incidental activity in the electronics industry where screen and, to a much lesser degree, lithographic printing processes are used in the production of all types of electronic circuitry (Kinter 1992). No estimate of the value of printing in the electronics industry was found.

Firms in two industry segments, commercial printing and newspapers, accounted for 56.9 percent of the total value of industry shipments in 1991 (20 percent and 36.9 percent, respectively). Other industry segments covering firms involved primarily in printing (i.e., periodicals, books, business forms, and greeting cards) accounted for an additional 28.9 percent of the value of shipments (USIO 1992).

The remaining 14.2 percent of the total value of shipments is accounted for by firms engaged in publishing, bookbinding, and printing trade services, that may or may not actually be engaged in printing. Firms involved in book publishing and miscellaneous publishing accounted for 8.2 percent of the total value of shipments. Firms specializing in the production of blankbooks and binders and in bookbinding accounted for 2.7 percent. Lastly, firms providing printing trade services such as platemaking and typesetting accounted for the remaining 3.3 percent of the total (USIO 1992). The break down of printing industry segments by market share is summarized in Figure 8.

The total value of shipments for the printing, publishing, and allied trade industries is expected to increase by about 2.5 percent to \$136.5 billion (constant 1987 dollars) in 1992. However, during the five year period 1987 through 1991, the total value of the shipments for the printing and publishing industry declined at an annual average rate of almost 0.6 percent. Decline in value of shipments during the five year period was greater for manifold business forms, newspapers, and blankbooks and binders. The value of shipments for these three industries declined at an average annual rate of 5.8, 4.4, and 3.6 percent, respectively. Three additional industry categories experienced a smaller overall decline during the period: bookbinding, miscellaneous publishing, and periodicals (USIO 1992).

Only three industry categories showed moderately strong growth in value of shipments (in constant 1987 dollars) during the period. Platemaking services grew at an average annual rate of 3.1 percent, book printing at 2.6 percent, and commercial printing at 2.4 percent (USIO 1992).

**MARKET SHARES FOR PRINTING
INDUSTRY SEGMENTS, 1987 AND 1991**
(BASED ON ANNUAL TOTAL VALUE OF SHIPMENTS)

	<u>1987</u>	<u>1991</u>
NEWSPAPERS	23.4%	20.0%
PERIODICALS	12.7	12.6
BOOK PUBLISHING	2.4	2.7
BOOK PRINTING	9.3	9.5
MISCELLANEOUS PUBLISHING	5.7	5.5
COMMERCIAL PRINTING	32.9	36.9
MANIFOLD BUSINESS FORMS	5.4	4.4
GREETING CARDS	2.1	2.4
BLANKBOOKS & BINDERS	2.1	1.9
BOOKBINDING	0.9	0.8
TYPESETTING	1.3	1.3
PLATEMAKING SERVICES	<u>1.7</u>	<u>2.0</u>
TOTAL	100.0	100.0

Figure 7. Market Shares for Printing Industry Segments

Table 6. Printing and Publishing Industry (SIC 27) Trends and Forecasts

Industry Category	Value and Percent of Shipments (1987 millions of dollars)						Percent Change					
	1987	1988	1989	1990*	1991*	1992**	1987-88	1988-89	1989-90	1990-91	1991-92	1987-91
2711 Newspapers	31,850 23.4%	30,855 22.5%	29,987 22.1%	28,488 21.2%	26,636 20.0%	26,982 19.8%	-3.1	-2.8	-5.0	-6.5	1.3	-16.4
2721 Periodicals	17,329 12.7%	17,599 12.8%	17,727 13.1%	17,408 12.9%	16,816 12.6%	17,136 12.6%	1.6	0.7	-1.8	-3.4	1.9	-3.0
2731 Book Publishing	12,620 9.3%	12,853 9.4%	12,500 9.2%	12,375 9.2%	12,623 9.5%	13,001 9.5%	1.8	-2.7	-1.0	2.0	3.0	0.0
2732 Book Printing	3,256 2.4%	3,470 2.5%	3,544 2.6%	3,600 2.7%	3,635 2.7%	3,725 2.7%	6.6	2.1	1.6	1.0	2.5	11.6
2741 Miscellaneous Publishing	7,810 5.7%	7,711 5.6%	7,283 5.4%	7,320 5.4%	7,280 5.5%	7,500 5.5%	-1.3	-5.6	0.5	-0.5	3.0	-6.8
275 Commercial Printing	44,786 32.9%	46,007 33.5%	46,638 34.4%	47,804 35.6%	49,143 36.9%	50,765 37.2%	2.7	1.4	2.5	2.8	3.3	9.7
2761 Manifold Business Forms	7,397 5.4%	7,251 5.3%	6,779 5.0%	6,257 4.7%	5,819 4.4%	5,877 4.3%	-2.0	-6.5	-7.7	-7.0	1.0	-21.3
2771 Greeting Cards	2,911 2.1%	2,922 2.1%	3,099 2.3%	3,130 2.3%	3,146 2.4%	3,209 2.4%	0.4	6.1	1.0	0.5	2.0	8.1
2782 Blankbooks & Binders	2,904 2.1%	2,915 2.1%	2,700 2.0%	2,605 1.9%	2,500 1.9%	2,560 1.9%	0.4	-7.4	-3.5	-4.0	2.4	-13.9
2789 Bookbinding	1,176 0.9%	1,180 0.9%	1,162 0.9%	1,135 0.8%	1,105 0.8%	1,110 0.8%	0.3	-1.5	-2.3	-2.6	0.5	-6.0
2791 Typesetting	1,784 1.3%	1,866 1.4%	1,678 1.2%	1,720 1.3%	1,769 1.3%	1,828 1.3%	4.6	-10.1	2.5	2.8	3.3	-0.8
2796 Platemaking Services	2,373 1.7%	2,501 1.8%	2,559 1.9%	2,588 1.9%	2,678 2.0%	2,767 2.0%	5.4	2.3	1.1	3.5	3.3	12.9
=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
TOTAL Value of Shipments	136,196	137,130	135,656	134,430	133,150	136,460	0.7	-1.1	-0.9	-1.0	2.5	-2.2

* - Estimate.
** - Forecast

Source: USIO 1992.

Table 7 provides additional information on recent trends in four major industry categories (i.e., newspapers, periodicals, book printing, commercial printing) for the period 1987 through 1992. In addition to value of shipments for each category, the table provides information on total employment, number of production workers and their average hourly earnings, capital expenditures, and trade data (USIO 1992).

B. International Trade

Table 8 provides information on U.S. imports and exports related to the printing and publishing industries. In 1990, the latest year for which information was available, the value of U.S. exports outpaced imports by almost two to one (\$3.1 billion in exports compared to \$1.9 in imports) (USIO 1992).

As might be expected, Canada is the single largest trading partner of the U.S. for goods and services produced by the printing and publishing industry. In 1990, Canada accounted for over 27 percent of exports and 29 percent of imports. The countries of the European Community account for a slightly larger percentage of our total trade in this area than Canada - 22.8 percent of exports and 40.3 percent of imports. In 1990, the only region with which the U.S. had a trade deficit in the area of printing and publishing was East Asia excluding Japan (USIO 1992).

C. Outlook for the Major Printing Markets

Table 9 presents a forecast of industry trends for the period 1990 through 2000. It should be noted that the table is not directly comparable to Table 5 above. Table 9 uses a different breakdown of industry categories than Table 6 does; it also excludes the category of newspapers. On the other hand, Table 9 includes at least one industry category not covered in Table 6, quick printers.

Table 9 shows that growth in the industry is expected to average between 3.8 and 5.3 percent annually, a higher rate of growth than experienced in recent years. Areas of particularly strong growth are expected to be: other advertising (i.e., print advertising other than direct mail and coupons and inserts) and free circulation papers (eight to nine percent annually); quick printing (five to eight percent); and direct mail (five to six percent) (SRI 1990).

Table 7. Trends and Forecasts for Major Industry Categories

Industry Category							Percent Change				
	1987	1988	1989	1990*	1991*	1992**	1987-88	1988-89	1989-90	1990-91	1991-92
2711 NEWSPAPERS											
Industry Data											
Value of Shipments (\$MIL)	31,850	32,927	34,146	35,273	34,744	37,107	3.4	3.7	3.3	-1.5	6.8
Value of Shipments (1987\$MIL)	31,850	30,855	29,987	28,488	26,636	26,982	-3.1	-2.8	-5.0	-6.5	1.3
Total Employment (000)	434	432	431	431	422	426	-0.5	-0.2	0.0	-2.1	0.9
Production Workers (000)	148	146	147	145	142	143	-1.4	0.7	-1.4	-2.1	0.7
Average Hourly Earnings (\$)	11.38	11.42	11.80	12.29	12.41	12.78	0.4	3.3	4.2	1.0	3.0
Capital Expenditures (\$MIL)	1,523	1,631	1,985	- - -	- - -	- - -	7.1	21.7	- - -	- - -	- - -
Product Data											
Value of Shipments (\$MIL)	30,495	31,461	32,457	33,074	32,446	34,523	3.2	3.2	1.9	-1.9	6.4
Value of Shipments (1987\$MIL)	30,495	29,488	28,530	26,961	25,074	25,325	-3.3	-3.2	-5.5	-7.0	1.0
Trade Data											
Value of Imports (\$MIL)	- - -	- - -	96.1	62.0	52.7	60.0	- - -	- - -	-35.5	-15.0	13.9
Value of Exports (\$MIL)	- - -	- - -	28.6	37.7	40.0	47.0	- - -	- - -	31.8	6.1	17.5
2721 PERIODICALS											
Industry Data											
Value of Shipments (\$MIL)	17,329	18,612	19,787	20,717	21,339	23,131	7.4	6.3	4.7	3.0	8.4
Value of Shipments (1987\$MIL)	17,329	17,599	17,727	17,408	16,816	17,136	1.6	0.7	-1.8	-3.4	1.9
Total Employment (000)	110	111	116	112	110	112	0.9	4.5	-3.4	-1.8	1.8
Production Workers (000)	18.3	19.1	20.7	20.7	20.7	20.9	4.4	8.4	0.0	0.0	1.0
Average Hourly Earnings (\$)	11.06	11.99	12.45	12.87	13.15	13.61	8.4	3.8	3.4	2.2	3.5
Capital Expenditures (\$MIL)	246	246	272	- - -	- - -	- - -	0.0	10.6	- - -	- - -	- - -
Product Data											
Value of Shipments (\$MIL)	16,492	17,664	18,748	19,629	20,218	21,916	7.1	6.1	4.7	3.0	8.4
Value of Shipments (1987\$MIL)	16,492	16,664	16,673	16,373	15,816	16,117	1.0	0.1	-1.8	-3.4	1.9
Trade Data											
Value of Imports (\$MIL)	- - -	- - -	140.0	122.0	105.0	117.0	- - -	- - -	-12.9	-13.9	11.4
Value of Exports (\$MIL)	- - -	- - -	448.0	666.0	740.0	851.0	- - -	- - -	48.7	11.1	15.0

Table 7. Trends and Forecasts for Major Industry Categories (continued)

Industry Category	Percent Change										
	1987	1988	1989	1990*	1991*	1992**	1987-88	1988-89	1989-90	1990-91	1991-92
2731 BOOK PUBLISHING											
Industry Data											
Value of Shipments (\$MIL)	12,620	13,571	14,074	14,850	15,965	17,245	7.5	3.7	5.5	7.5	8.0
Value of Shipments (1987\$MIL)	12,620	12,853	12,500	12,375	12,623	13,001	1.8	-2.7	-1.0	2.0	3.0
Total Employment (000)	70.1	70.2	73.9	71.3	72.0	74.0	0.1	5.3	-3.5	1.0	2.8
Production Workers (000)	15.9	16.5	17.1	16.4	16.6	17.0	3.8	3.6	-4.1	1.2	2.4
Average Hourly Earnings (\$)	10.67	10.76	11.56	11.90	12.25	- - -	0.8	7.4	2.9	2.9	- - -
Capital Expenditures (\$MIL)	240	302	319	- - -	- - -	- - -	25.8	5.6	- - -	- - -	- - -
Product Data											
Value of Shipments (\$MIL)	11,630	12,156	12,981	13,695	14,725	15,905	4.5	6.8	5.5	7.5	8.0
Value of Shipments (1987\$MIL)	11,630	11,466	11,461	11,346	11,573	11,920	-1.4	0.0	-1.0	2.0	3.0
Trade Data											
Value of Imports (\$MIL)	- - -	- - -	746.0	845.0	925.0	1015.0	- - -	- - -	13.3	9.5	9.7
Value of Exports (\$MIL)	- - -	- - -	1288.0	1428.0	1500.0	1625.0	- - -	- - -	10.9	5.0	8.3
275 COMMERCIAL PRINTING											
Industry Data											
Value of Shipments (\$MIL)	44,786	47,460	50,312	53,080	55,730	59,900	6.0	6.0	5.5	5.0	7.5
Value of Shipments (1987\$MIL)	44,786	46,007	46,638	47,804	49,143	50,765	2.7	1.4	2.5	2.8	3.3
Total Employment (000)	554	557	569	575	564	575	0.5	2.2	1.1	-1.9	2.0
Production Workers (000)	401	402	414	418	410	418	0.2	3.0	1.0	-1.9	2.0
Average Hourly Earnings (\$)	9.93	10.01	10.34	10.70	10.85	- - -	0.8	3.3	3.5	1.4	- - -
Capital Expenditures (\$MIL)	2,013	1,898	2,135	- - -	- - -	- - -	-5.7	12.5	- - -	- - -	- - -
Product Data											
Value of Shipments (\$MIL)	43,995	46,597	49,621	52,350	54,965	59,085	5.9	6.5	5.5	5.0	7.5
Value of Shipments (1987\$MIL)	43,995	45,166	45,968	47,117	48,436	50,034	2.7	1.8	2.5	2.8	3.3
Trade Data											
Value of Imports (\$MIL)	- - -	- - -	388.0	393.0	450.0	500.0	- - -	- - -	1.3	14.5	11.1
Value of Exports (\$MIL)	- - -	- - -	811.0	772.0	925.0	1060.0	- - -	- - -	-4.8	19.8	14.6

* - Estimate.

** - Forecast

Source: USIO 1992.

Table 8. U.S. Trade Patterns in 1990 (\$mil)

		TOP FIVE TRADING PARTNERS										
		Exports		Imports								
						Exports				Imports		
Industry Category	Trading Partner	Value	% Share	Value	% Share	Trading Partner	Value	% Share	Trading Partner	Value	% Share	
2700 PRINTING & PUBLISHING	Canada & Mexico	1,601	50.9	362	19.3	Canada	1,490	47.3	Canada	329	17.6	
	European Community	606	19.3	715	38.2	United Kingdom	297	9.4	United Kingdom	324	17.3	
	Japan	247	7.8	207	11.1	Japan	247	7.8	Hong Kong	209	11.2	
	East Asia NICs	147	4.7	476	25.4	Australia	161	5.1	Japan	207	11.1	
	South America	80	2.5	22	1.2	Mexico	111	3.5	Italy	115	6.1	
	Other	467	14.8	90	4.8							
	World Total	3,148	100.0	1,872	100.0		2,306	73.3		1,184	63.2	
2721 PERIODICALS	Canada & Mexico	547	82.1	74	60.7	Canada	528	79.3	Canada	70	57.4	
	European Community	69	10.4	33	27.0	United Kingdom	36	5.4	United Kingdom	22	18.0	
	Japan	9	1.4	7	5.7	Mexico	19	2.9	Japan	7	5.7	
	East Asia NICs	8	1.2	4	3.3	Netherlands	16	2.4	Mexico	4	3.3	
	South America	9	1.4	1	0.8	Japan	9	1.4	Spain	4	3.3	
	Other	24	3.6	3	2.5							
	World Total	666	100.0	122	100.0		608	91.3		107	87.7	
2731 BOOK PUBLISHING	Canada & Mexico	697	48.8	59	7.0	Canada	664	46.5	United Kingdom	209	24.7	
	European Community	308	21.6	408	48.3	United Kingdom	171	12.0	Hong Kong	131	15.5	
	Japan	88	6.2	107	12.7	Australia	106	7.4	Japan	107	12.7	
	East Asia NICs	81	5.7	211	25.0	Japan	88	6.2	Italy	79	9.3	
	South America	30	2.1	14	1.7	West Germany	42	2.9	Singapore	54	6.4	
	Other	225	15.7	46	5.4							
	World Total	1,429	100.0	845	100.0		1,071	74.9		580	68.6	
275 COMMERCIAL PRINTING	Canada & Mexico	248	32.1	122	31.1	Canada	209	27.0	Canada	115	29.3	
	European Community	176	22.8	158	40.3	Japan	135	17.5	West Germany	46	11.7	
	Japan	135	17.5	43	11.0	Switzerland	67	8.7	United Kingdom	43	11.0	
	East Asia NICs	37	4.8	48	12.2	United Kingdom	66	8.5	Japan	43	11.0	
	South America	28	3.6	1	0.3	Mexico	39	5.0	France	23	5.9	
	Other	149	19.3	20	5.1							
	World Total	773	100.0	392	100.0		516	66.8		270	68.9	

Source: USIO 1992.

Table 9. U.S. Printing Industry Forecast 1990 to 2000

Industry Segment	Forecast Annual Percent Growth 1990 - 2000*
Magazines and Other	
Periodicals	2 - 3
Catalogs and Directories	3 - 4
Direct Mail	5 - 6
Labels and Wraps	0 - 2
Inserts and Coupons	3 - 4
Other Advertising and Free	
Circulation Papers	8 - 9
Annual Reports and Related	
Products	4 - 5
Business Forms	1 - 2
Business Communications	2 - 3
Manuals and Technical	
Documentation	-2 - 0
Quick Printing	5 - 8
Books	1 - 2
Printing Trade Services	3 - 4
Industry	3.8 - 5.3

* Based on constant 1988 dollars.

Source: SRI 1990.

A number of major more traditional areas of printing are expected to grow at well below the industry average during the decade. Book printing and business form printing are expected to experience growth of only one to two percent annually while the printing of magazines and other periodicals is expected to increase by two to three percent per year (SRI 1990).

1. Magazine and Periodical Publishing

Growth in the magazine and other periodicals market is expected to average two to three percent annually through the end of the decade. The outlook in the market is for a greater number of titles, shorter press runs per title, and greater emphasis on local and regional editions of national magazines as well as the personalization of advertising. Offset printing will continue to dominate this market (SRI 1990).

2. Catalogs and Directories

During the 1990s, growth in the catalogs and directories market is expected to average three to four percent

annually. Rising distribution costs and competition from other advertising media will result in the consolidation of catalog firms as they seek lower production costs and alternative methods of product delivery (SRI 1990).

The strongest growth in the market during the decade will be for business-to-business catalogs (e.g., office supply catalogs). Overall there should continue to be moderate growth in the mail-order catalog segment of the market although the number of specialty catalogs published will decline. Due to increased postage costs, catalogs distributed through the mail will be smaller and use lighter papers. (SRI 1990).

Directory printing is expected to increase over the next few years. Growth will be fueled primarily by the demand for local directories and abridged versions of large directories. Demand for large business directories will grow but at a slower rate than before (SRI 1990).

3. Direct Mail

Direct mail is expected to be one of the fastest growing areas in the printing industry during the 1990s. It is anticipated that growth in the industry will average five to six per cent annually. Major changes will occur in the direct mail printing business segment by the year 2000. The industry will consolidate through acquisitions and specialization. The direct mail printer will see the number of jobs increase. However, production runs will be smaller as mailing lists are continuously refined to target select groups. Growth in telecommunications technologies will permit a greater level of direct contact between the customer and the printer, thus allowing for more revisions and faster turnaround of direct mail materials. In response to customer demand for more frequent revisions and faster turnaround, the industry will make increasing use of in-line printing (SRI 1990).

4. Labels and Wraps

The labels and wraps segment of the printing market is expected to experience an average annual rate of growth of between zero and two percent during the 1990s, one of the lowest rates in the industry. This weak growth will result from the decline in the growth of the number of packaged goods. However, a greater variety of package sizes will result in more but shorter production runs. To meet customers needs, label and wrap printers will have to provide greater customization, higher quality images, and the ability to work with more complex materials.

5. Advertising Inserts and Coupons

The advertising inserts and coupons segment is expected to grow between three and four percent annually during the 1990s, a rate somewhat lower than that anticipated for the printing industry as a whole. Printers specializing in advertising inserts and coupons may lose market share to daily newspapers who are expected to compete for this type of business in order to keep their large flexographic presses operating at near capacity. Competition can also be expected from operators of non-heatset offset presses, another area where overcapacity exists (SRI 1990).

6. Other Advertising and Free Circulation Papers

During the 1990s this market segment is expected to be the industry growth leader with an expected annual growth rate of eight to nine percent. "Other advertising" refers to printed advertising other than direct mail and coupons and inserts. Examples include booklets, brochures, and circulars directly distributed to consumers. Printers of other advertising materials will be influenced by the need for smaller, specialized production runs as well as by the need for a greater variety of products, especially materials tailored to sell to a specialized audience. Advertisers will insist on the increased use of color and distinguishing features in their advertising. Quick printers will put economic pressures on larger printers as they attempt to capture a larger portion of this market for themselves (SRI 1990).

Free circulation papers, currently produced primarily by small local printers, are expected to experience moderate growth into the late 1990s. However, during the decade this market will increasingly attract the interest of large printers, and, as a result, small local companies will see their share of the market decline. Growth and increasing competition in the free circulation paper market will require printers to use more color and to improve the overall quality of their product. Furthermore, printers will make increasing use of flexographic presses instead of the non-heatset offset presses that now dominate printing in this market (SRI 1990).

7. Annual Reports

During the 1990s, growth in the annual reports market is expected to average four to five percent annually. Because corporate clients are extremely conscious of the image portrayed by their annual reports, this segment of the printing industry continually pushes the industry as a whole to higher and higher standards in color production. Most commercial printers avoid this highly specialized, demanding area of business.

Presently, there are only about 30 large printing firms involved in producing annual reports and the number of companies in this market segment is not expected to show any marked change over the next ten years (SRI 1990).

8. Business Forms

At one to two percent annually, growth in the business form printing market will be well below growth in the printing industry as a whole during the nineties. A growing number of small and medium-sized printers are expected to enter this market where they will be competitive with larger firms when small to medium volume runs are required. However, the growing ability of personal computers equipped with laser printers to generate forms on demand could potentially result in loss of market share by both large and small printers (SRI 1990).

9. Business Communication

During the 1990s, growth in the business communications printing market (e.g., preprinted letterhead, envelopes and memo forms) is expected to average two to three percent annually. Growth in demand for business communications products will decline due to: the growing versatility of telecommunications technology (E-mail, voice mail, etc.) reducing the need for printed business communications materials; high quality computer driven electrostatic and ink-jet printers, facsimile machines, and color copiers allowing businesses to produce much of this material in-house; and cost conscious businesses making greater use of generic printed products such as memo pads and phone message pads (SRI 1990).

10. Manuals and Technical Documentation

This is the only printing market sector that may actually experience negative growth during the 1990s. During the decade the market for manuals and technical documentation is expected to decline by as much as two percent annually or, at best, to remain flat. The largest client of this market has been the U.S. government, particularly the Department of Defense. The two major factors affecting this market are: 1) reduction in the U.S. defense budget and 2) the development of the DOD Computer Aided Logistics System (CALs) which will provide on-line access to technical documentation, engineering drawings, parts lists, and other pertinent data. With fewer new defense systems procurements, the demand for technical manuals is declining and will continue to decline unless the present world political situation changes dramatically (SRI 1990).

11. Convenience or "Quick" Printing

Convenience or quick printing will be one of the major growth areas of the printing industry during the 1990s. Growth in the market is expected to be between five and eight percent annually. Quick printers are distinguished not so much by a particular printing technology as by a commitment to very fast job turnaround. Traditionally, quick printers relied primarily on xerographic reproduction; however, many now employ presses, especially small sheetfed lithographic presses, or act as brokers for full-service printers (SRI 1990).

Quick printers will capture a growing share of business that previously would have gone to small- and medium-size commercial printers. Traditional printers have long been able to provide higher quality products than the average quick printer. However, new equipment that allows the delivery of higher quality products coupled with a growing demand for rapid turn-around by cost-conscious clients has increased the market for quick printing services. Many quick printers also offer consultation, design, composition, and desk-top publishing services. They use personal computers, electronic mail, and facsimile to communicate directly with their customers. The market share for quick printers will continue to grow well into the late 1990s as additional new technologies come on line. These new systems will result in lower production costs and will help quick printers remain very competitive with traditional printers, particularly in the low-end color printing market (SRI 1990).

Appendix D lists the top 100 North American quick printing operations for 1990.

12. Books

Growth in the book printing market is expected to be very slow in the 1990s, averaging only one to two percent annually. Publishers will pressure printers to reduce production costs in order to keep the retail price of books as low as possible. The number of book printers has declined by more than 40 percent since 1977; even greater consolidation in the industry will occur over the next few years as more and more medium to large capacity printers are squeezed out of the market. This will open opportunities for smaller book printers to enter the industry in support of small, specialized publishers who have a need for short runs. However, improvements in technology will produce less waste and reduce labor requirements, thus making short run jobs more attractive to large printers (SRI 1990).